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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/773,004

02/04/2004

Stephen W. Montgomery

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BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

EXAMINER

MCCRACKEN, DANIEL

ART UNIT

PAPER NUMBER

1754

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

03/22/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/773,004	Applicant(s) MONTGOMERY ET AL.	
	Examiner Daniel C. McCracken	Art Unit 1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 January 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) 11-27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Citation to the Specification will be in the following format (S. #, ¶) where # denotes the page number and ¶ denotes the paragraph number. Citation to patent literature will be in the form (Inventor #, LL) where # is the column number and LL is the line number.

Election/Restrictions

Applicant's election without traverse of Group I, Claims 1-10 in the reply filed on 1/17/2007 is acknowledged. Claims 11-27 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to nonelected inventions, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 1/17/2007.

Claim Rejections - 35 USC § 112

Claims 1-10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The analysis for determining whether a claim is supported by the disclosure is cast in terms of whether "undue experimentation" is necessary to practice the invention. *See* MPEP 2164.01. In examining the claims in light of the supporting disclosure, the Federal Circuit has provided a non-exclusive list of factors to consider in determining whether a disclosure is enabling. *See generally In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). These factors include:

- a. The breadth of the claims;
- b. The nature of the invention;
- c. The state of the prior art;
- d. The level of one of ordinary skill;
- e. The level of predictability in the art;
- f. The amount of direction provided by the inventor;
- g. The existence of working examples; and

Art Unit: 1754

- h. The quantity of experimentation needed to make or use the invention based on the content of the disclosure

Id. “Whether undue experimentation is needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations.” *Id.* Examiner has considered all factors in light of all claims rejected makes the following findings of fact:

a. The breadth of the claims

Claim 1 is the broadest claim in the elected group. Drawn to a method, the claim recites opening nanotubes and bringing them into contact with “connector molecules.” Claim 1 is worded broadly in that it does not recite what a “connector molecule” is, other than it bonds (i.e. “connects”) with the carbon nanotube.

b. The nature of the invention

The elected group is essentially drawn to a method of making a three-dimensional nanotube structure. Claims 7-10, while depending upon Claim 1, introduce some “hybrid” limitations (i.e. making a composite with the three-dimensional nanotube structure). However, at the core of the invention is the three-dimensional nanotube structure, which is the focus of this enablement rejection.

c. The state of the prior art and the level of one of ordinary skill

A well developed body of prior art exists in the fields of nanotechnology and fullerene chemistry. One of ordinary skill in the art would presumably be familiar with carbon nanotubes, their production, and assorted functionalization/derivitization reactions associated with carbon nanotubes.

d. The level of predictability in the art

While advances have been made in producing carbon nanotubes with some level of predictability (i.e. greater yields and controlled orientation), the field as a whole is still

Art Unit: 1754

subject to some degree of unpredictability owing to the fact that it deals with structures on the molecular scale.

e. The amount of direction provided by the inventor

With respect to the elected group, the Examiner considers the passage at (S. 4, [0017] – 8, [0031]) as the only direction provided by the inventors germane to the elected group. Paragraph [0017] refers to Figure 1, which “illustrates” the method of making the nanotube structure. Succinctly stated, the method involves taking a nanotube, taking a “connector” molecule and “connecting them.”

Beginning at (S. 6, [0024]), Applicants delve into slightly more detail, explaining that the “connector molecule” is actually sulfur bonded to the end of a carbon nanotube. To the sulfur, carbon atoms are bonded “in layers” until they reach the apex of a cone. *See generally* (S. 6, [0025]– 7, [0027]) *and* Figs. 2A-3B. In this sense, if Applicants are in fact “building” onto the end of a carbon nanotube, Applicants use of the term “connector molecule” is inapposite, as no such molecule ($C_{19}S_6H_{24}$) was actually “reacted” with the carbon nanotube.

On the topic of “reactions,” none were discussed. No details were provided as to whether this is a gas phase reaction or a liquid phase reaction. No details were discussed as to the preparation of the “connector molecule,” e.g. reagents, operating conditions (temperature, pressure, etc.). All that was discussed was which atom was connected to what. *See generally* (S. 6, [0024] *et seq.*) A rudimentary understanding of how many electrons exist in a given atom’s outer electron orbitals lets one conceptually stick atoms together, much like “Tinkertoys”. Making the compound in practice however is another matter.

f. The existence of working examples

No working examples were provided. No SEM images. No x-ray diffraction data. Applicants have provided several hand-drawn figures.

Art Unit: 1754

g. The quantity of experimentation needed to make or use the invention based on the content of the disclosure

As there is no evidence of experimentation in the Applicants' specification, arguably infinite experimentation is necessary to make or use the invention – if it can even be made.

Claims 1-10 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Applicants have not described the process for making the three-dimensional nanotube structure in sufficient detail such that it would convey to one of ordinary skill in the art that Applicants had possession of the claimed invention. No process conditions, reagents, etc. were discussed. In view of the relative size of the nanotube and the $C_{19}S_6H_{24}$, it would not seem that the molecule could be readily coaxed into the interior. Experimental evidence of this material should be presented.

Claim Rejections - 35 USC § 102

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2 and 6-10 are rejected under 35 U.S.C. 102(e) as being anticipated by US 6,970,425 B1 to Smalley.

With respect to Claims 1-2, Smalley discloses the opening of carbon nanotubes and connecting them to a connector molecule. (Smalley 13, 17-23). As to Claim 6, Smalley discloses a filtering process. (Smalley 16, 35 *et seq.*). As to Claims 7-10, Smalley discloses making a

Art Unit: 1754

polymer matrix. (Smalley 3, 51-55). Statements of intended use (i.e. as a heat dissipation device) are not given patentable weight.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel C. McCracken whose telephone number is (571) 272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

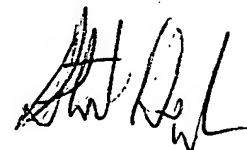
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Daniel C. McCracken

DCM



STUART L. HENDRICKSON
PRIMARY EXAMINER